Perceptual and Motor Skills, 1985, 60, 37-38. © Perceptual and Motor Skills 1985

GEOPHYSICAL VARIABLES AND BEHAVIOR: XXI. GEOMAGNETIC VARIATION AS POSSIBLE ENHANCEMENT STIMULI FOR UFO REPORTS PRECEDING EARTHTREMORS

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Summary.—The contribution of geomagnetic variation to the occurrence of UFORs (reports of UFOs) within the New Madrid States during the 6-mo. increments before increases in the numbers of IV-V or less intensity earthquakes within the central USA was determined. Although statistically significant zero-order correlations existed between measures of earthquakes, UFORs and geomagnetic variability, the association between the latter two deteriorated markedly when their shared variance with earthquakes was held constant. These outcomes are compatible with the hypothesis that geomagnetic variability (or phenomena associated with it) may enhance UFORs but only if tectonic stress and strain are increasing within the region.

Several studies (1, 2, 3) have indicated the contribution of a geomagnetic factor in the occurrences of reports of UFOs (UFORs). Its occurrence during periods of tectonic stress, as defined by increased earthquake activity, appears to increase the likelihood of UFORs within the same region. The factor is strongly correlated with measures of dispersion or variability, such as the standard deviation of geomagnetic indices for the temporal elements of the increment. For monthly increments of analyses, an example measure is the standard deviation of daily Ap values (a measure of global geomagnetic activity) around the monthly mean.

To test the hypothesis that a geomagnetic variation (GV) factor contributes to UFORs if an increase in earthquake activity is imminent, the number of UFORs per 6-mo. increment (January-June; July-December) were sorted for the years 1950 through 1965 ($n = 30$ increments) from the UFOCAT file (Center for UFO Studies) for the six states surrounding the New Madrid Region (5). Total numbers of quakes of IV or V or less intensity per 6-mo. increment for these states and the surrounding states (5) were also determined. Two measures of geomagnetic activity were selected. The first was simply the mean of the monthly Ap values for each 6-mo. increment. The second (the variation) measure was the standard deviation of the monthly Ap values around the mean of each 6-mo. increment.

The 6-mo. increment of analyses was selected since previous work (4) has shown this temporal chunk demonstrates one of the highest bivariate correlations between UFORs and appropriate seismicity within large areas, such at 1 Mkm^2, compared to 1-mo., 3-mo., or 2-yr. increments. Although one year increments also show clear bivariate associations between UFORs and earthquake measures, 6-mo. increments were selected because of the larger degrees of freedom. Increments of similar duration are not unusual to discern many types of geophysical phenomena.

Since measures of UFORs tended to be skewed, square root transformations were completed. (No other transforms were tested.) All statistical analyses employed SPSS software on a DEC 2020 system computer. The zero-order correlations between the measure of UFORs and the standard deviations of the monthly Ap values (GV) the increment before, the increment during or the increment after the UFORs were −0.19, 0.52, and 0.05, respectively; only the contemporary correlation was statistically sig-

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nificant ($p \leq 0.01$). On the other hand, the zero-order correlations between numbers of UFORs and the numbers of events of low intensity during the increment, before, during, or after the UFORs were 0.20, 0.21, and 0.71, respectively. UFORs were significantly correlated only with seismic activity of the next increment. Similarly, the only significant zero-order correlation between the numbers of earthquakes and GV occurred with the values of GV from the previous increment (0.53), that is, during the same increment as the UFORs. The correlations between the mean of monthly geomagnetic activity per increment and UFORs or earthquakes during the next increment were positive ($rs \leq 0.35$) but not statistically significant.

If the occurrence of a geomagnetic variation factor requires increased tectonic strain (imminent seismicity) in order to contribute to the occurrence of UFORs, then the zero-order correlation between GV and UFORs should be attenuated when the shared variance between UFORs and earthquakes is removed. To test this hypothesis, partial correlation (Partial Corr) analyses were completed between each combination of pairs for the three variables after variance associated with the third variable had been removed. When GV was held constant, the correlation between earthtremors and UFORs, the increment before was 0.62 (zero-order $r = 0.71$) and remained statistically significant. When the variance associated with earthtremors was held constant, the partial correlation between UFORs and geomagnetic variability was 0.32 (zero-order $= 0.53$), which was not statistically significant. Interestingly when the variance associated with the numbers of UFORs was held constant, the partial correlation between earthtremors and GV from the previous increment dropped from 0.47 to a nonsignificant 0.15. The means and standard deviations for the measures were (square root of) UFORs (7.68 ± 2.34), earthtremors (4.64 ± 2.85) and geomagnetic variability (4.64 ± 2.85). Scattergrams clearly indicated that the significant zero-order correlations were not due to outliers. The same analyses employing square root transformations of quakes and GV did not alter the results.

These data support the hypothesis that geomagnetic variability during the temporal increments by which UFORs are analyzed may increase the likelihood of UFORs if seismicity is about to increase in the area. Similar patterns have been noted in a smaller area (unpublished data for Yakima, Washington) when monthly increments were employed: a single daily Ap value of equal to or more than 100 in a month was always followed by an increase in numbers of UFORs within 30 days but *only* if nearby seismicity was increasing. Interestingly, Winkler (5) has argued that geomagnetic perturbations, triggered by close passage of comets to the earth, are clearly associated with the more intense UFO "flaps."

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Accepted December 17, 1984.